Research Article

Impacts of Mobile UX Design on Older Adults

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Abstract

   Usage of mobile technologies is making an essential part of our daily life. User experience depends on usefulness and usability of an application or technology. These both concepts are measured with high degree of quality when check the functionality of a mobile service provided by a mobile application. Leading technologies make interactions easy and increase user quality of experience. For older adults mobile technologies must be easily understandable, meaningful, engaging and motivating them towards technology. For achieving the usability goals mobile technologies should design carefully and used by the older adults effectively. Mobile design interface matter a lot for all these concepts.

Keywords: User Experience; Older Adults; Mobile UX Design; Usability; Mobile Applications; User Centered Design (USD)

Introduction

   With the passage of time technologies provided up to date content and functions to the users in the form of user interface (UI) but due to these UI most of applications are becoming complicated and it also affects the user's usability of mobile application. Mobile is an essential part of daily life [2]. The use of mobile is common in routine life; actually, it is the part of our routine life. Today's technology increase day by day and now your mobile is your radio, calculator, watch, recorder, computer, telephone, camera etc. latest mobile technology some time complex to understand and use, so there is a need to be work on design especially for aged people [2].

   Technology and internet helps everyone in daily life, elder adults take advantage of it by communication in their social circle. Users of elder age are increasing rapidly and therefore their demands about mobile technology also increases. Many elders feels difficult in using mobile technology, they make themselves away from mobile technology and fear of using technology because of lack of technology knowledge and show less interest towards digital society. But when they back to technology world their negative

effects of aging minimizes and their self-esteem increases. While talking about UI of mobile applications elder user's best practices on mobile is avoid wrong actions and perform tasks on mobile devices by focusing on the influence of fingers [2].

   Aging people are faced many problems during use of latest mobile technology. There is needed to be work on aging adults design and problems faced by aging persons [5]. The design and evaluation of mobile interfaces for aging adults are becoming more important as the population ages and their use of technology increases [5]. Health care system took a step forward with the help of technologies for the betterment of the older adults in their daily routine life. It is imperative to provide them innovative technology which is accessible and make their lives easier but somehow they are reluctance to the innovative technology such as mobile applications.

   Most trending internet users are older adults and growing population. Compared to younger users typically, they have diverse characteristics and may have changes in perceptual abilities, motor skills; cognitive abilities are also change with respect to older

adults. Confidence is the major factor which distinguishes the younger with elders in the use of technology [8]. The literature as User Centered Design (USD) process prospective arise the traditional user center design. It provides the guidance of development for elderly population's method to find appropriate way to development of the aim of involve of the user [8, 10]. Its basic principal approaches to design process and use of various techniques to collect the data first and then develop its prototype to initiate the design which users will be asked to test.

Design guidelines and checklist are very important and useful for designing and developing applications for older adults. 2006 to 2014 coding standards shows that when deal with visual and hepatic issues of smart phones, button size, color contrast and textual interface should be easy in entry and should give timely feedback [10]. Older adults face chronological changes which include change in their vision, hearing, motor and cognition skills that effect in their use of mobile applications. Research shows that aging process affects the cognition, perception and interaction of humans. Combination of design guidelines and heuristic evaluation is a valuable tool for designing a less expensive, low resource and quick tool for developing age-friendly interfaces of mobile applications [19].

The general population using advanced technologies impact due to increase of elderly population development group in significant contribution of improving quality of life that provide new technologies of these population elderly active aging and independent living to helping them in live community by development on the specific need of services based population. The design process is more important to developer know the users of targets elderly product suitable useable must be taken in unique needs, limitations and capabilities, to use effective approaches and interaction for data gather and how they used in elderly prefers to data information about features and attributes to understand the factor to allow the improve usability of the products [8].

This paper is organized into five sections. Section II describes the problems. Section III describes the methods. Section IV addresses the results and comparisons of results. Section V summarizes the gaps and proposes future work. Section VI summarizes the conclusion of paper. And the last section consists of references used in the paper.

Problems

The use of mobiles in aging people is an increase in recent times. The mobile interface is a problem for older adults because it's difficult for them to understand many changes in mobile interface design and apps. There is a need for a universal design for them. Special interfaces for mobile are used by aging people to solve their problem. There is a requirement to be easy going interfaces for them to solve the problems they mostly face during complex mobile interface design. The development of new multimode applications for smart phones, to make elder become healthier, addressing problem of medication factors to non adherence to age related as inherent medication, increase, cognitive and de-motivation management providing multimodality fully supporting with the medication [5].

Problem 1: Mobile interface and design for older adults (1)

The mobile interface is an important issue for aged people; because sudden and regular changing in mobile interface and also in the design of apps is creating problems for them. It is difficult to understand changes in the interface for them. There is need to be universal design and interface for aging people to easy to use and understand mobile interface and mobile apps [2].

Problem 2: Design of mobile phones for older adults (2)

The use of mobiles in aging people is an increase in recent times. They are no longer used only for voice talk and text communication; smart phones can also be consumed as assistive technologies via the different applications installed on mobile. Complex interface and complicated designs of the app is a big issue for aging people to get benefits from mobile technology. There is very important to include older adults in design face to make sure easiness of aging generation to get assistance from this technology [2].

Problem 3: Presbycusi

Common problem for elder is loss of hearing and this is called presbycusis which is containing in elders occurs due to gradually loss of hearing. According to research estimation about 30% of elders have this impairment. GOMS does not considered any type of errors or any influence from environment such as fatigue from the environment. KLM has similar problem as GOMS [5].

Problem 4: Frustration from technology

Elders have technology fear and lack of confidence in using the technical technology. Elders quickly frustrated if they could not get their answers quickly and they would start to swear and get angry with test team [12].

Problem 5: Confusion in manage Applications

Many mobile applications are used to guide the elderly for daily check up with the help of health care mobile applications but large number of patients does not use the applications which assist them to manage the diabetes. Technology acceptance is very crucial factor for the users especially in the medical field when health directly concerns with the lives of people and to solve these problem develop such technology which independently and confidently used by elderly without any confusion and assistance [11].

Problem 6: Short display screen

Display screen space is very small and these are crowded with many contents and functions that confuse the users and user interface design of the application to shop tend to decreased [12,23].

Problem 7: Complex graphics and icons

Most of the applications shows that to maintaining the UI design it seem to have metaphors in the applications with simple, excessive icons and graphics which make complexity for the users [4].

Problem 8: Privacy issues

Mobile phone is a biggest problem of this field. Some of these problems arise due to third party privacy software to use in mobile device. Some mobile while using take user further privacy system which becomes problem for users. For example, mobile tracking and Wi-Fi, Bluetooth tracking system. So, further mobile device biggest problem solved [3].

Problem 9: Difficulties in adaption of UI feature

Elder person with health problem does not have aptitude to use electronic devices, should have desire to control its own medication personas commonly through computer or mobile device speak with family and friend and primary parsons requirements identifying following expectations wants to able use of same application of arthritis, report side effect, report medication, application prevent should gap in medication, and provide alerts. User interface based on big text and big images created vision problem on low proficiency with technology usually elders and UI follows the extra bars, icons and buttons avoiding in Metro style guideline. Furthermore auto zoom user aware difficulties adapt to UI feature [1].

Methods

Now awareness of mobile technology is increased in aging people and use of mobile also. Many research and studies conducted for useful and easy to use the design for older adults. The complex interface of the mobile and complicated design of apps is a major issue of aging people. It's tough for them to understand daily basis changes in interface and design. Multiple methods used to solve this problem like survey, checklist, prototypes, guidelines, reviews etc.

Method 1: Mobile interface and design for older adults

In this paper, they suggested mobile touch screen interfaces for aging population. The research study is about an overview of the Universal Design Mobile Interface Guidelines, UDMIG v.2.1, and the related evaluation checklist. UDMIG v.2.1 and the assessment checklist were established to confirm usability of future mobile technology for older adults through a universal design strategy that accommodates all older users to the good range promising. Problem 1 is solving by this method.

Method 2: Design of mobile phones for older adults

Design guidelines and checklists are suggested as a useful tool in the development and evaluation of interface design of mobile phones for older adults. Given the intense evolution of mobile phone design, understanding how the design guidelines and checklists have taken into account the advances in mobile phone usability for older adults is important for their correct application and future development. Problem 2 is solved by this method.

Method 3: Literature study

Literature study was done to solve problem 3 and on its bases some problems are highlighted which are faced by most of the elder adults.

Method 4: SUS

SUS scale consists of 10 items and it utilizes 5 point Liker scale. These items statements simply tells the system how to use and also tells that the user feels comfort and ease in using the system. The user gives the feedback by scoring 1 "strongly agree" to 5"strongly disagree". When SUS score calculated if it shows 70 above score it considered as "usable" after computed on the scale from 0 to 100.

Method 5: GOMS

GOMS is typically an analytical approach for evaluating the computer interaction with the humans. This technique is used for dividing complex tasks into sub tasks. Tasks and goals are the user needs which they want to achieve by interacting and it explained the overall performance of the systems. It also includes the menu selection and presses buttons. This method usually used for predicting the user taking time to perform a defined task. But this method has a disadvantage that it does not considered any type of errors or any influence from environment. Problem 4 is solved by this method.

Method 6: Data set construction

To find the participants that are convenient for the sampling, initially this technique is used to interview data collection. Data collected from different sources such as Blekinge institute of technology, health centers and retirement homes.

Method 7: Data analysis

Glucoiso application provided to the participants and quantitative and qualitative data obtained from the participants which describes the usability and attributes of the user experience and user interface designs usability.

Method 8: Experimental setup

Data gathered by random assignment done by control group and experimental group by using Glucoiso application and the UX prototype is tested by experimental group. Conclusions are made by comparing the observed statically values.

Method 9: SEM

Structural equation modeling used for analyzing the data and it clearly showed that user interface had a momentous effect on the usability of the applications and the intention of using the applications to shop.

Method 10: ATM

Technology acceptance mode (ATM) is widely used for exploring the user's behavior and how it effects the applications of the user's experience to shop.

Method 11: Conduct Interviews

Convenience sampling technique is performed of the non-probabilistic sampling. User experience is evaluated by original Glucosio application. Authors take interviews of elder adults. A user experience test is conducted which is same as the usability test and user experience is measured along with the usability. This test is conducted by the prototype version of the previously discussed application. Dataset is collected by taking interviews by using various sources approached to find the participants of that application. Balsamic tool is used to design the interface in easier and smarter way. All the evaluations are then integrated by the QoE probe code and questionnaire's results are integrated by the android studio IDE. Problem 3 is solved by this method.

Method 12: Focus group Discussion

In this method experiments were conducted in which different people of different ages were told to use the mobile and their experiences were gathered on the paper.

Method 13: Usage pattern study

A study to usage pattern was also done to know the reasons of facing difficulty by elder adults.

Method 14: Online questionnaires

Online questionnaires are conducted to take user feedback and inquire user's problem. Questions are designed in such a way that user perceive it as real life problem and trying to solve. Trying attempts are used as methodology in mobile UX problem solving. Problems 5, 6 and 7 are solved by this method.

Method 15: Experimentation

Study between people 50 years old and less to find out whom takes help form hardware and software.

Method 16: Thematic analysis

They developed a thematic analysis were able to figure out the aging barriers. And draw a thematic map after performing thematic analysis. Problem 9 is solved by this method.

Method 17: Elderly centered development Method

This iterative methodology described requirement aligned with prototype is proposed and evaluated in order to refine the requirement toward as increasingly refined application. The system requirement adopted five stage method aligned in context scenarios personas.

Method 18: Elderly centered development method

The first stage of behavioral variables, to identify activities, attitudes, motivations skills and significant behavioral patterns to analyze the results and following these guides personas to relevant goals to possible characteristics to expanded in order description of the parson's design only beginning primary should be created in elderly centered development parsons. On the second stage of produced the requirements to get the context scenarios problem and vision of statement of population USD. The third stage brainstorming main idea should be filtered with people from different domain and end-users. Problem 5 is solved by this method.

On the fourth stage of parsons is very important to understand the main end-user and its expectations by the same people context, scenarios are defined to create the requirements and aware of information gathered during development process and not only requirement elicitations. On the five stages of evaluation method adopted characteristics of application and its end-users consists of three phase, conceptual validations, prototype, and pilot test.

Results

Interview's results are the data of user experience. User assigned tasks and their user experience results are evaluated in the form of a table.
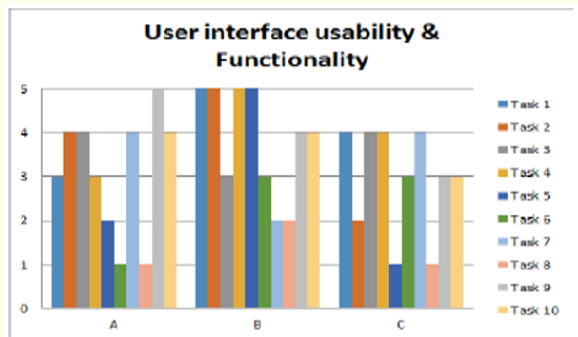

Figure 1: Rating for the tasks by Control Group of sampling.

By evaluated the successful completion of task done by user their user experience is evaluated. And their task completion success rate is shown by standard deviation. The average success rate of Glucosio application's participants is 60% [1].

- People told what type of design were beneficial for the older people.eg (screens should be wide and beneficial, icons should be enlarged)
- A document was made that clarified the points that annoy the older people.
- Due to design verification it was make sure whether the changes made are good or not.
- A complete analysis through different questionnaires was done and so result was gained that the older people do not feel comfortable due to the complex design.

The result of usability evaluation that stand out the weakness and strength of the application suggestion change through the analysis of the opinion question of the medication assistant data collected from observation and notes on the regarding evaluation interaction, identified users consider more difficult to several features to easier of user [5].

Comparison of results

By comparing results it is observed that UX have shown an improvement in all the attributes of the in the experimental group as compared to the control group. This is because elders felt ex-

citement when they were able to perform the tasks independently without any help [15]. This improvement in about all the attributes of user experience may be because of to two of the participants of the experimental group completely unaware of the mobile technology and they were very excited to experience the use of mobile application during performing task. The older adults were paying more interest in using the application that consists of only one button for view their outputs, rather than navigating through different menu options. Most of the elder adults were showing interested in using the mobile applications only after getting help and guidance by another person by easily use the application.

For problem 5, 6, 7, 8 a complete analysis through different questionnaires was done and so result was gained that the older people do not feel comfortable due to the complex design, is best result. For next 4 problems results found were:

- Four barriers were recognized they were:

Cognition physical abilities, perception and motivation

- They were able to develop a frame work that could help to improve the usability in older adults in the field of medical.

Paper [1] and paper [2] both are about interface and design of mobiles and mobile application. Paper [1] is a review based on checklist and guidelines validation and comparison. The second paper [2] is also about review and checklist but this paper also contains useful tool suggestion for development and evaluation of design for older adults. The second paper is in brief form and uses more scientific way for their results. First, one [1] gives simple overview and suggestion and future direction but the second one [2] detailed review and study based results. Give future directions and valuable results.

Discussion on gaps
Mobile interface and design for older adults

The future work will require validation of the guidelines through older adults groups who confirm the interface is perfect for them or not.

Design of mobile phones for older adults

This study also highlights the need for research that would empirically validate the design guidelines and checklists in the future.

SUS does not work with big data and it become less usable and is quite paradox and it opens up a better opportunity for the re-

searchers in the area o relationship between SUS and task computation on various web usability levels.

SUS

Elders would be thoroughly judged and could look into what are the cause elders to get annoyed while being online.

Iterative prototyping testing

It is experienced that it does not focus on many important elements such as audio, notifications, preferences Etc. These elements can be conducted with such application that is mostly used by elderly population by many considerable iterative prototyping testing as it is not considered with Glucosio application.

Gap 5: Improve user experience

Application developers and user interface designers must improve the user's mobile experience and the usability of applications to shop so that users can easily use the applications for shopping without any confusion.

Conclusion

By using HCI heuristic and design principals and age-friendly design of smart phone with gestural interfaces have influenced new usability dimensions that need to be expended. On screen based controller buttons are important and raised keypad buttons with clear and rapid feedback. Scroll button, auditory click, voice-based keyboard and tactical feedback facilitate elder adults and make interface easy to understand [11]. Display with high contrast, clear zoom-in options, and appropriate graphics with simple and meaningful icons by using appropriate colors and adjustable audio-video aids make devices compatible. Touch screens minimize the usability issues, improve vision and memory dexterity and increase multi-tasking functionality [14,20].

USD product based development should following principles ;knowledge gathering concerning users, needs, attitude and characteristics, prototypes redesigns, active involvement of user, iteration of design solution, and multidisciplinary design steams. The process of product development of USD one of the most important contribution of requirement stage of creation personas, and personas are families, age, name, hobbies and goals to used personify to principal characterize for the function of the product design [16,21]. Personas are the important tools of and objectives of the teams and evaluate the usability of effectiveness product and personas allow us to use of scope and nature of design problem's USD development method general and adapted when developing application for older adults [13,25].

And increased the use of new multimode interaction requirement, design, evaluation and development process must b also part of population [24]. Moderate amount of research in the area of human factors engineering and other related fields such as psychology has been published for using websites and its usability for older adults but it needs more promotion in order to adoption of technology.

Elderly is rapidly growing population in the field of using technology and the main focus is that they also used the M-health technology as they are hesitated to use these innovative technologies. Glucosio application exposed the user experience with samples taken by control and experimental groups. These changes can help the further developing applications for elderly population.

UI designs have significant effect on users experience such as usability of the applications as well as in the intention of the users for mobile application shopping experience. Major attributes shows that UI design quality and consistency have major impact on the user's experience mobile shopping applications.

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